

MICROGRIDS THE FUTURE OF ENERGY GENERATION



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Outline

- Introduction to Microgrid.
- Microgrid Operating Modes.
- The Need of Microgrid.
- Interconnected Microgrids – Power Parks.
- Environmental Aspects.
- Conventional Grid versus Microgrid.
- Advantages & Disadvantages of Microgrid.
- Future Directions on Microgrid Research.
- References.

Introduction To Microgrid

- What is Microgrid?
 - Small-scale power supply network.
 - Local power generation for local loads.
 - Highly flexible and efficient.

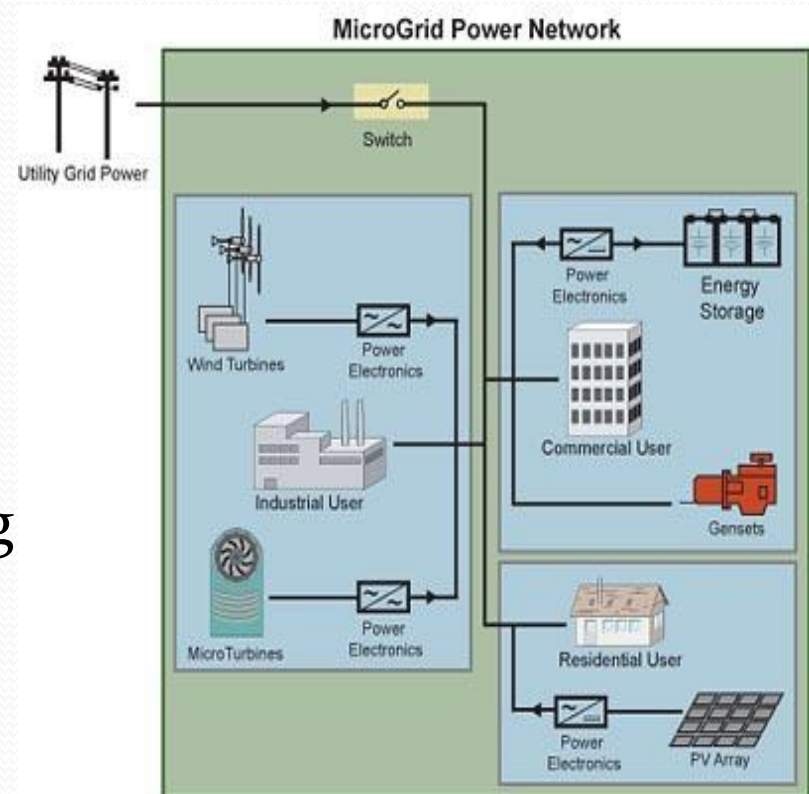
Introduction To Microgrid

- Contd.....
 - Connected to both the local generating units and the utility.
 - Excess power can be sold to the utility grid.
 - Size may vary.

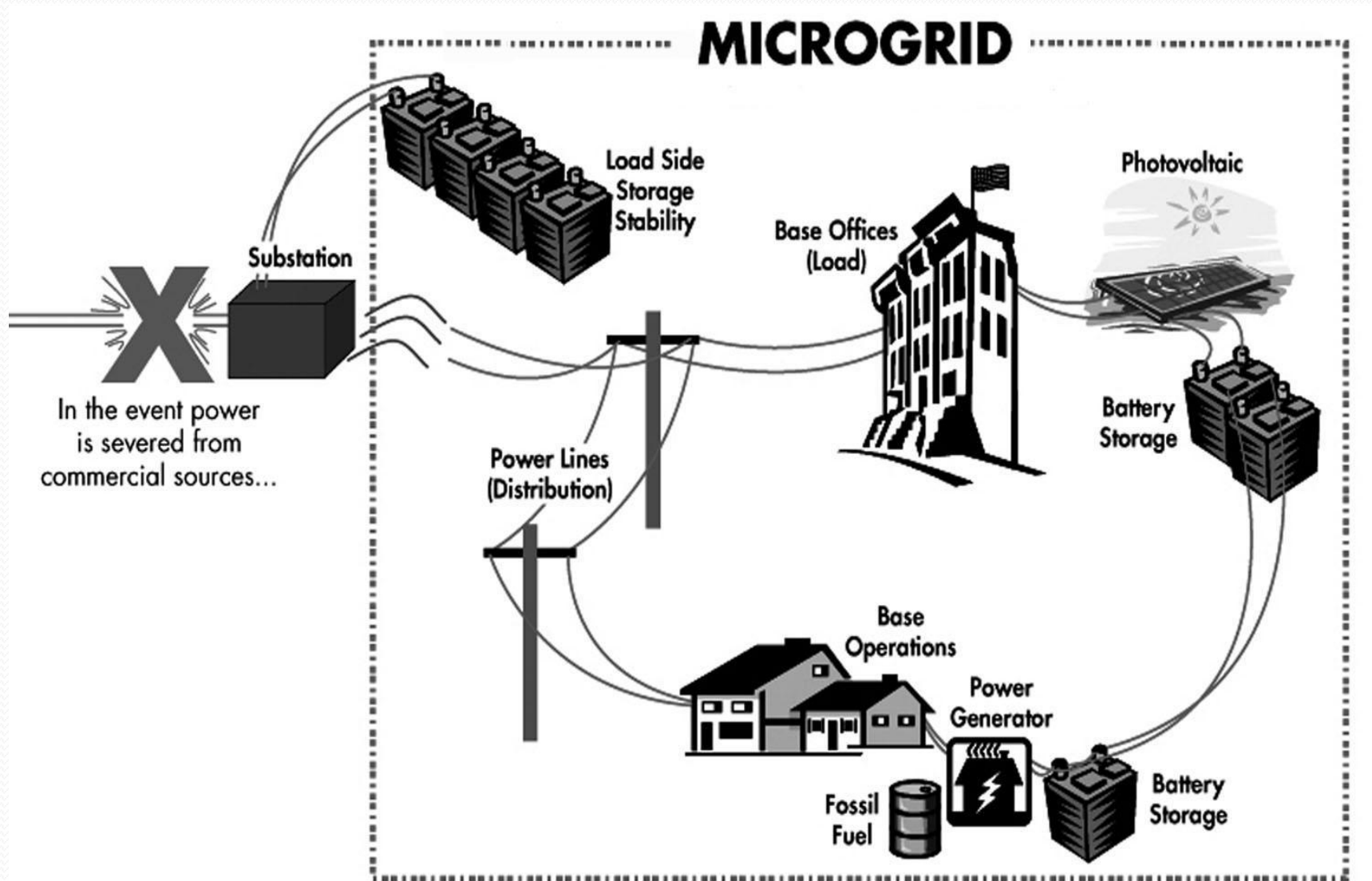
Introduction to Microgrid

- **Microgrid Components**

- Distributed Generation
- Loads
- Immediate storage
- Controller
- Point of Common Coupling



Typical Microgrid is shown below:



Gujrat, Village Jhakri



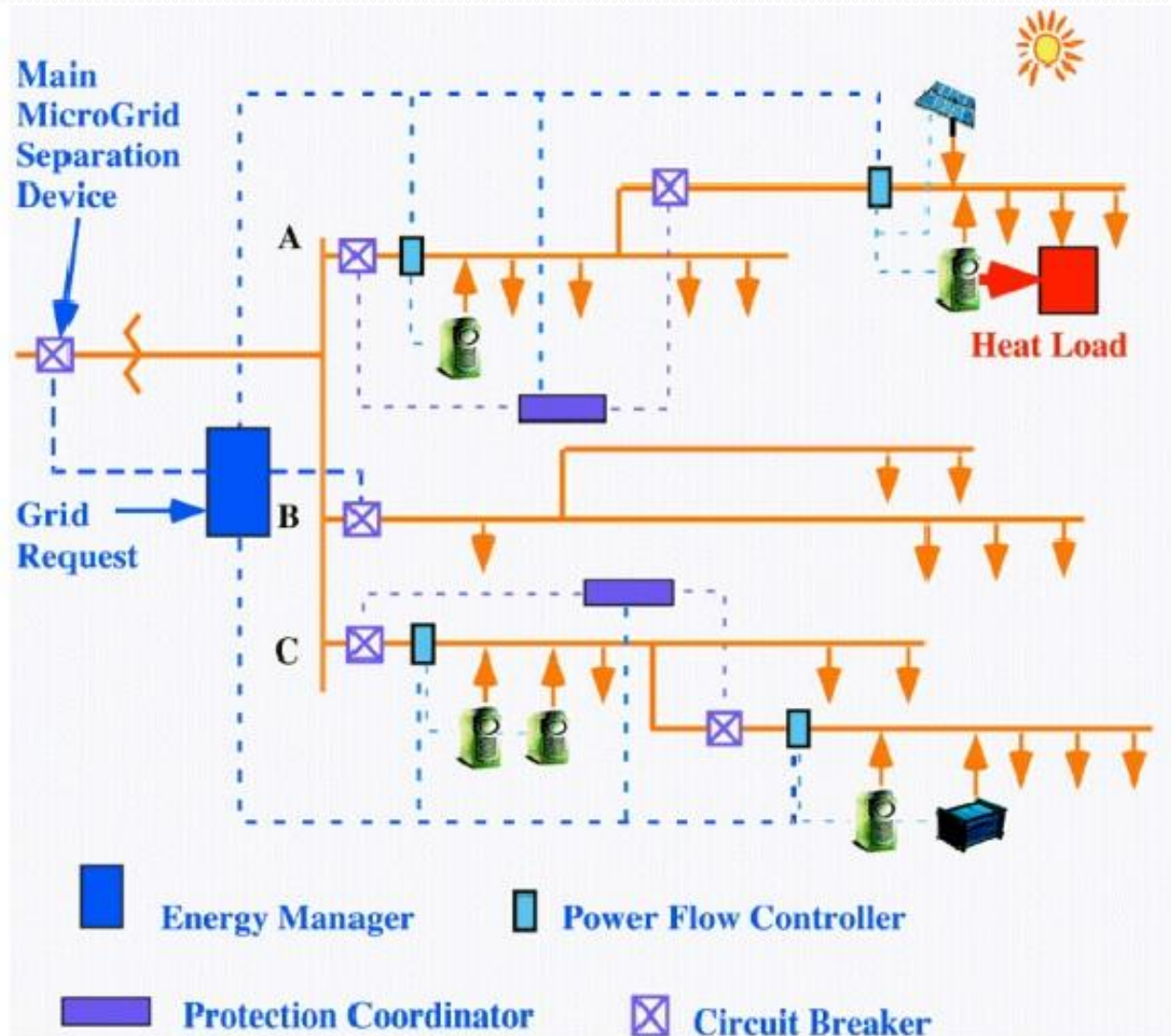
Arunanchal Pradesh, village- Kemson



How it Came into Existence?

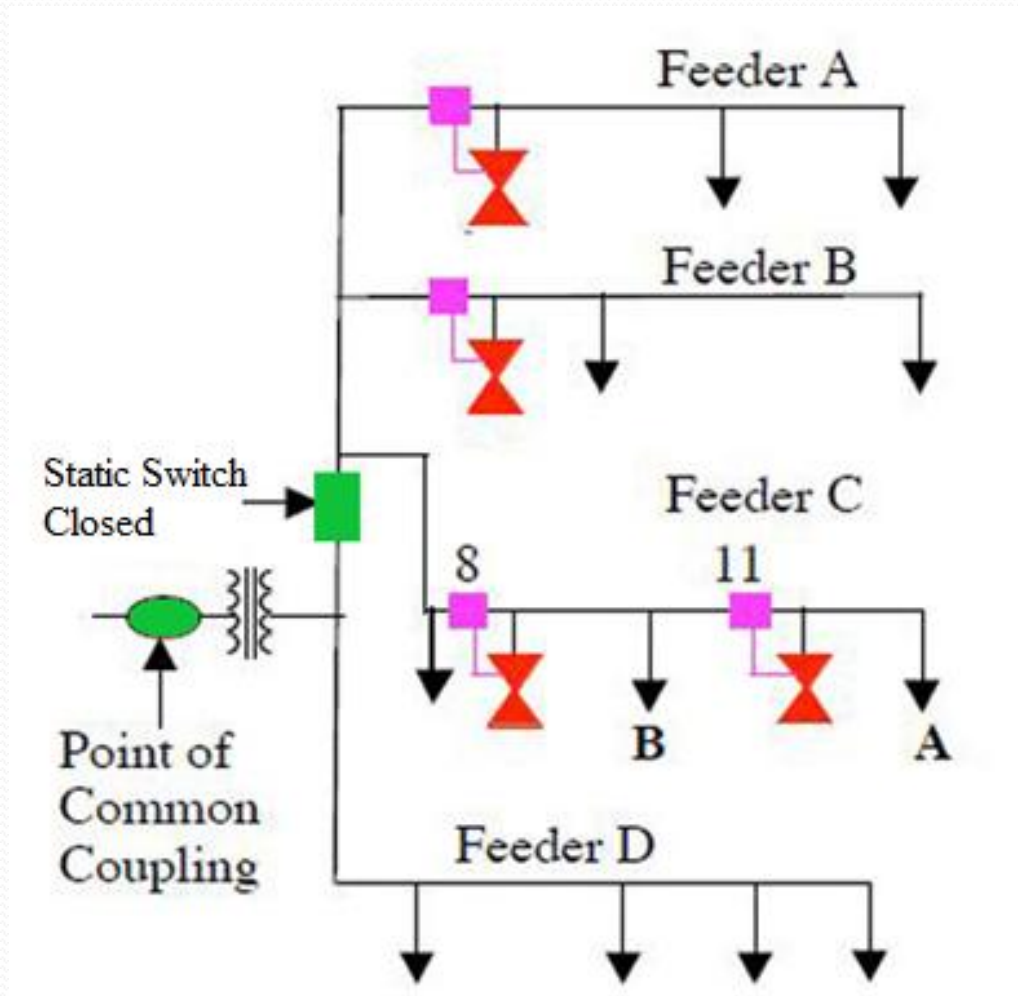
- In august 2003, 10 million people in Canada and 45 million people in US suffered from blackout for three days.
- In **INDIA** micro-grids were proposed in the wake of the **July 2012** India **blackout**:

Microgrid Architecture



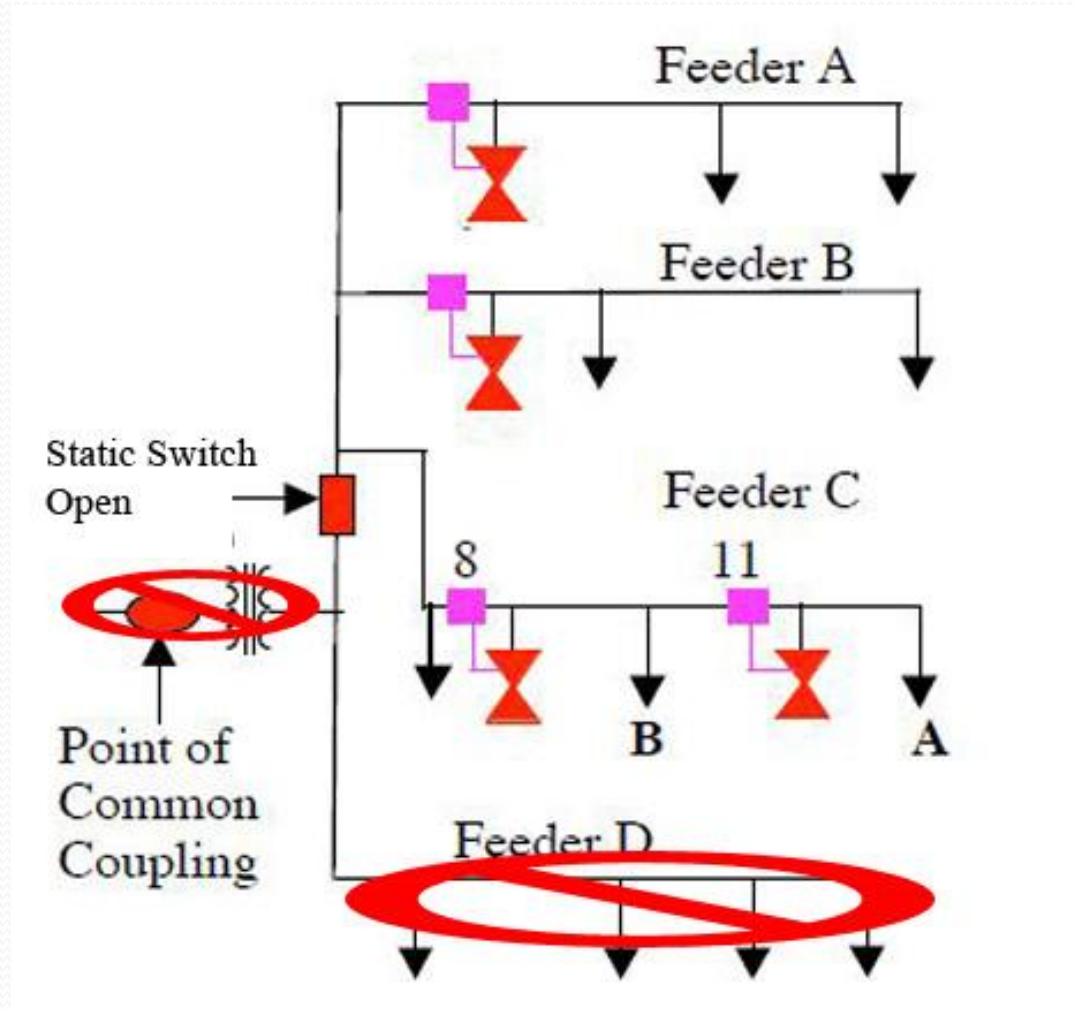
Microgrid Operating Modes

- Grid Connected Mode:



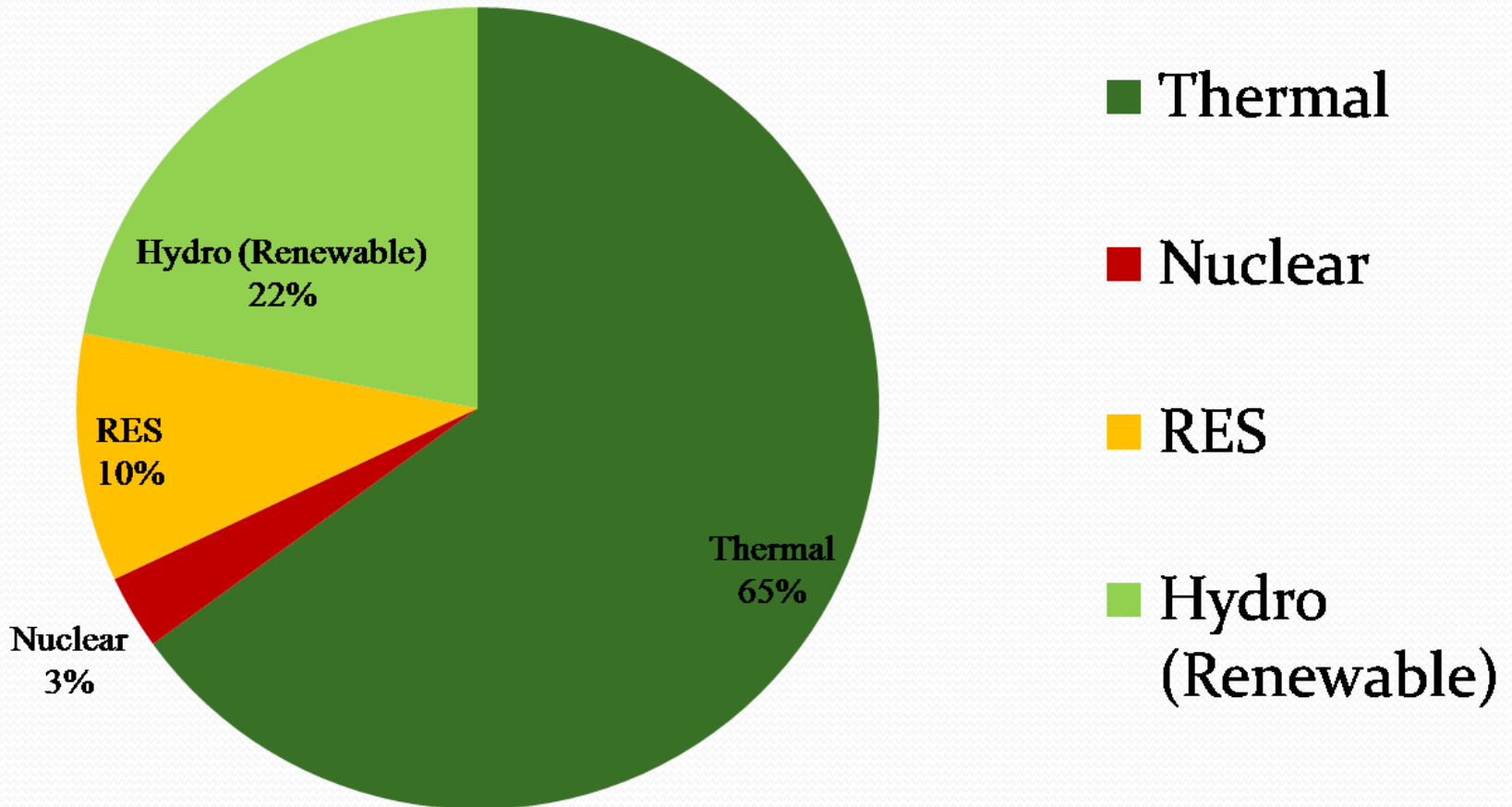
Microgrid Operating Modes

- Island Mode:



The Need of Microgrid

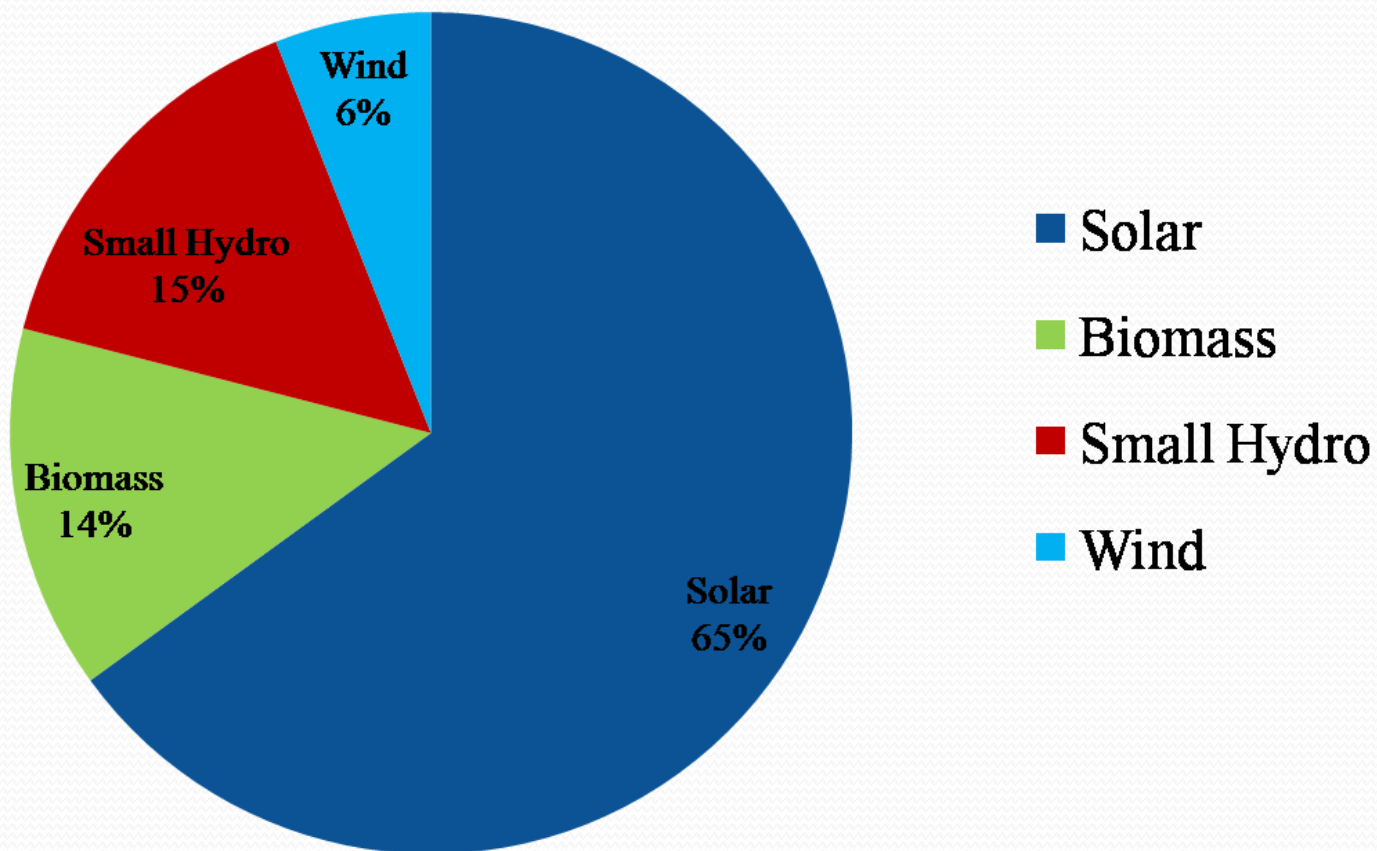
Distribution of India's Power Generation



***Renewable Energy Sources (RES)** includes small Hydro project, Biomass gasifiers, biomass power, Urban and industrial waste power and Wind power

Renewable Energy in India

% Breakup in India Dec. 2012



Thus.....

- Answer to our energy crisis.
- Transmission losses reduced.
- Substantial savings and cuts emissions without major changes to lifestyles
- High quality and reliable energy supply to critical loads
- May sell power back into the main-grid during periods of peak demand
- Best option

Interconnected Microgrids

Interconnected Microgrids – Power Parks

- According to IEEE recommendation: **maximum capacity** of micro-grid is **10MVA**.
- For larger loads, it is desirable to interconnect many Microgrids to form a larger Microgrid network called **Power Parks**.
- The advantages of this Microgrid structure insures greater stability and controllability for the **Power Parks**.

Environmental Aspects

- Microgrid encourages the use of the renewable energy sources.
- Large land use impacts are avoided.
- CO₂ Emissions are reduced.



Conventional Grid vs. Microgrid

- (1) Micro sources smaller capacity with respect to the large generators in conventional power plants.
- (2) Power generated at distribution voltage can be directly fed to the utility distribution network.
- (3) Micro sources are normally installed close to the customers' premises so that the electrical/heat loads can be efficiently supplied with satisfactory voltage and frequency profile and negligible line losses.



Advantages & Disadvantages

- **Microgrid Advantages**

- To separate and isolate itself from the utility during disturbance.
- In peak load periods prevents utility grid.
- Environmental benefits.
- Increased overall energy efficiency.
- Low cost.

Advantages & Disadvantages

- **Microgrid Disadvantages**

- Voltage, frequency and power quality must be considered and controlled to acceptable standards.
- Requiring more space and maintenance due to battery banks.
- Resynchronization with the utility grid is difficult.
- Microgrid protection

Challenges in Micro-grid Development

- ✓ High installation cost
- ✓ Standards are not yet available for addressing operation and protection issues.
- ✓ No standard legislation and regulations available.
- ✓ Market monopoly.

Conclusion

- ✓ Micro-grid, a new area in the power sector, has immense potential to reduce the effect of blackouts, power deficiencies and its autonomy helps to supply power uninterruptly to the customers.
- ✓ Its implementation requires restructuring of electrical standards, market rules and govt. grants, which are not a big issue but need some time.
- ✓ This revolution has a great effect, because still there are some places where electricity has not been reached yet and for them micro-grid is the only affordable, sustainable and reliable option.

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Thank You